Claims

We claim:

1. A heterojunction organic semiconductor field effect transistor, comprising:

a substrate (1),

a gate electrode (2) formed on the substrate (1),

a gate insulation layer (3) formed on the substrate (1) and the gate electrode (2),

a first semiconductor layer (4) formed on the gate insulation layer (3),

a source/drain electrode (5) formed on the first semiconductor layer (4), and

a second semiconductor layer (6) formed on the first semiconductor layer (4) and the source/drain electrode (5).

2. The field effect transistor according to claim 1, wherein the semiconductor material is organic semiconductor material or organic/inorganic hybrid material.

3. The field effect transistor according to claim 1, wherein the first semiconductor layer (4) or the second semiconductor layer (6) is made of a single kind of semiconductor material.

4. The field effect transistor according to claim 3, wherein the first semiconductor layer (4) or the second semiconductor layer (6) is made of a mixture, eutectic or laminated compound of two or more kinds of molecules.

5. The field effect transistor according to claim 2, wherein the carrier mobility in the active layer of the organic semiconductor is over $10^{-3}cm^2/Vs$.

6. The field effect transistor according to claim 3, wherein the semiconductor layer (4) and (6) are, respectively, comprised of one selected from the group consisting of CuPc, NiPc, ZnPc, CoPc, PtPc, H_2Pc, TiOPc, VOPc, thiophen oligomer, polythiophene, naphthacene, pentacene, perylene, PTCDA, fullerene, $F_{16}CuPc$, $F_{16}ZnPc$, $F_{16}FePc$ and $F_{16}CoPc$.

7. The field effect transistor according to claim 4, wherein the semiconductor layer (4) and (6) are, respectively, comprised of two or more selected from the group consisting of CuPc, NiPc, ZnPc, CoPc, PtPc, H_2Pc, TiOPc, VOPc, thiophen oligomer, polythiophene, naphthacene, pentacene, perylene, PTCDA, fullerene, $F_{16}CuPc$, $F_{16}ZnPc$, $F_{16}FePc$ and $F_{16}CoPc$.

8. A process for manufacturing a organic semiconductor field effect transistor containing a heterojunction, comprising the following steps:

Step a. forming a gate electrode on a substrate;

Step b. forming an insulation layer on the substrate and the gate electrode;

Step c. forming a first semiconductor layer on the insulation layer formed in Step b;

Step d. forming a source electrode and a drain electrode on the first semiconductor layer;

Step e. forming a second semiconductor layer on the source electrode, the drain electrode and the first semiconductor layer.

9. A process for manufacturing a organic semiconductor field effect transistor containing a heterojunction, comprising the following steps:

Step a. forming a first semiconductor layer on a substrate;

Step b. forming a source electrode and a drain electrode on the first semiconductor layer;

Step c. forming a second semiconductor layer on the first semiconductor layer, the source electrode and the drain electrode;

Step d. forming an insulation layer on the second semiconductor layer; and

Step e. forming a gate electrode on the insulation layer formed in Step d.